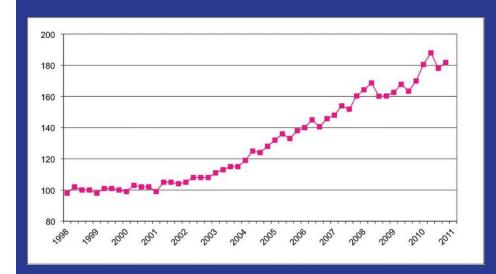
# **Beijing House Price (2016)**

Group 1: Cinny Lin (ycl461), Yihan Xu (yx1708), Yizhou Lu (yl5438)

# Why Housing Price?

# House prices

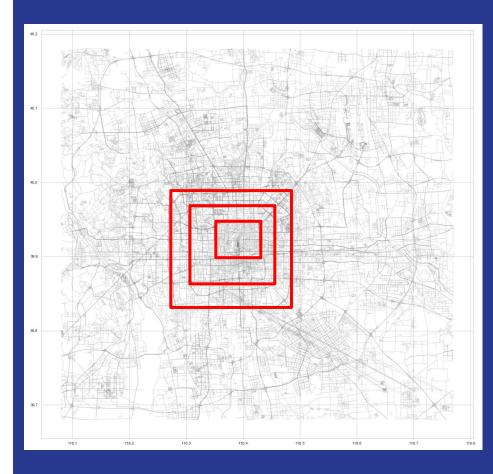
rising in China



# Why Beijing?

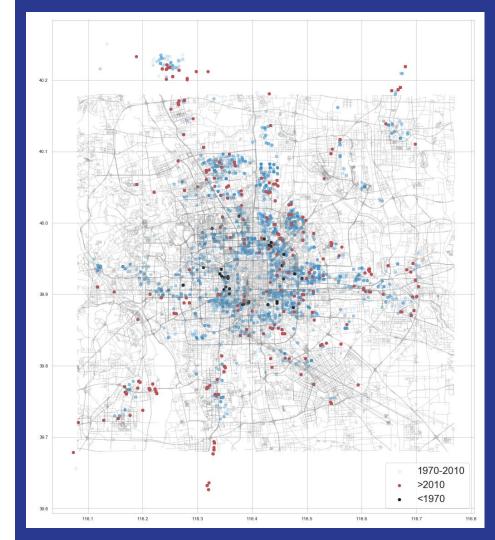
### Location

concentric city layout



# Age

coexistence of modern and ancient houses



#### Overview

#### Dataset

**10,682** observations of housing price in Beijing in 2016, from Lianjia.com

#### Question

What are the key factors that influence per unit housing prices in Beijing?

#### Hypothesis

**Location** and **age** are determinant factors.

# Variable Description and Relationships

# Basic Descriptive Statistics

Min LQ Med UQ Max

building Structure 6

0

0

							722-277-27	
price	9841	35891	48659	67151	147797	53082.72	22340.22	0.81
square	13.7	59	77.73	105.91	458	89.79	46.3	2.17
Lng	116.07	116.34	116.41	116.47	116.71	116.41	0.1	0.07
Lat	39.63	39.9	39.94	40	40.25	39.95	0.095	0.29
livingRoom	0	2	2	3	9	2.1	0.86	0.86
drawingRoom	0	1	1	2	5	1.19	0.57	0.36
kitchen	0	1	1	1	2	0.99	0.12	-3.54
bathRoom	0	1	1	1	6	1.24	0.53	2.35
construction Time	1944	1994	2002	2006	2016	1999.89	8.97	-0.92
ladder Ratio	0.01	0.25	0.33	0.5	2	0.38	0.19	2.07
elevator	0	0	1	1	1	0.61	0.49	-0.43
five Years Property	0	0	1	1	1	0.62	0.49	-0.49
subway	0	0	1	1	1	0.62	0.48	-0.51
building Type 1	0	0	0	1	1	0.28	0.45	0.99
building Type 2	0	0	0	0	1	0.0004	0.02	45.42
building Type 3	0	0	0	0	1	0.19	0.39	1.58
building Type 4	0	0	1	1	1	0.52	0.50	-0.09
renovation Condition 1	0	0	0	0	1	0.07	0.25	71.85
renovation Condition 2	0	0	0	0	1	0.03	0.17	5.44
renovation Condition 3	0	0	0	1	1	0.37	0.48	0.54
renovation Condition 4	0	0	1	1	1	0.53	0.5	-0.12
building Structure 1	0	0	1	1	1	0.53	0.5	71.85
building Structure 2	0	0	0	1	1	0.33	0.47	0.71
building Structure 3	0	0	0	0	1	0.0004	0.02	45.42
building Structure 4	0	0	0	0	1	0.04	0.21	4.37
building Structure 5	0	0	0	0	1	0.001	0.03	20.29
1 11 11 01								

N = 10331, Beijing, China, 2016

Mean

0.62

0.49

-0.5

Std.dev

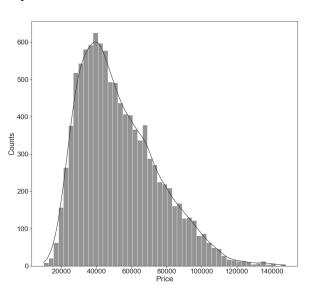
Skewness

# Basic Descriptive Analysis

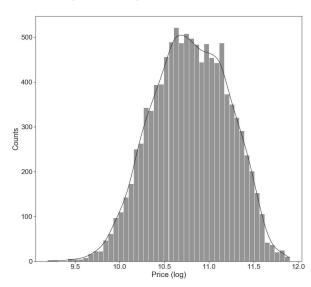
### price

house price per square unit

#### price



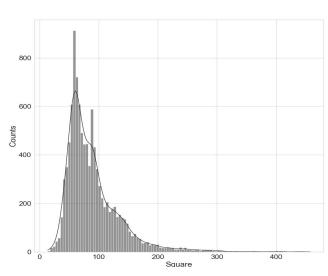
### log(price)



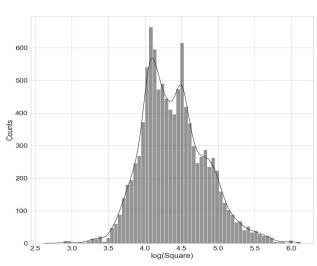
### square

total house size





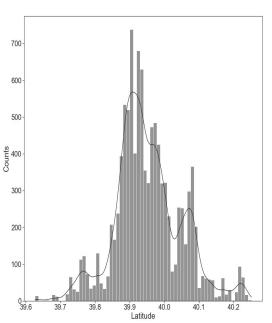
#### log(square)



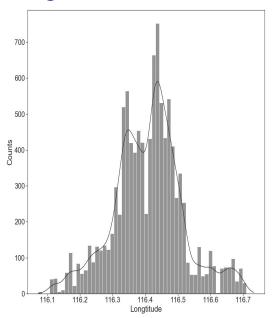
### **location**

latitude and longitude

#### latitude



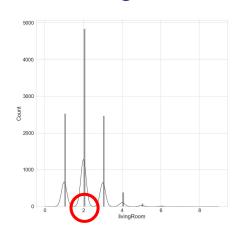
#### longitude



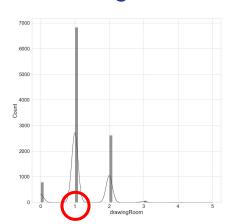
#### rooms

number of rooms in a house

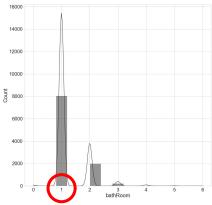
#### living room



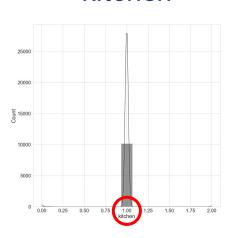
#### drawing room



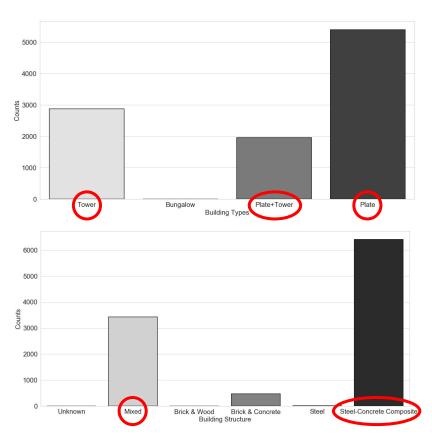
#### bathroom



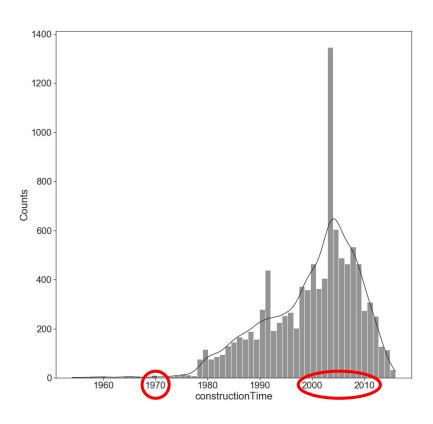
#### kitchen



### building type & structure



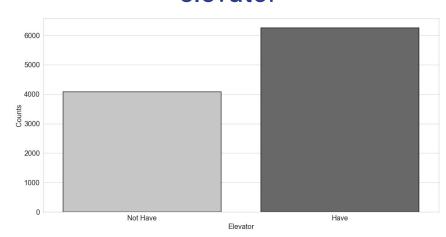
#### construction time



### transportation







# Correlation Matrix

price_log	1	-0.22	-0.45	-0.45	-0.1	-0.11			-0.11	-0.093	0.021	0.0081	-0.29		-0.055	0.088	0.33	0.056	0.051	0.064	-0.079	-0.11	-0.06	0.0024	0.077	-0.033	-0.056		-0.0097	-0.021	0.06			
square_log	-0.22	1			0.75	0.7	0.67	0.65	0.7	0.64	0.15		0.35		0.42	0.16	-0.15		-0.05	0.016	-0.03	0.019	0.074	-0.14	0.097	0.02	-0.16			0.049	0.17			
Lng_diff_quad	-0.45	0.056	1	0.15	0.027	0.019			0.0099	0.0071	0.022		0.2		0.069	-0.023	-0.31		-0.015	-0.009	0.085	0.014	0.08	-0.038	0.002	0.025	-0.0049		-0.0092	0.0053	0.0079			
Lat_diff_quad	-0.45	0.14	0.15	1	0.11	0.11	0.11	0.14	0.11	0.095	0.0083		0.19		0.11	-0.13	-0.21	-0.17	-0.012	-0.053	0.17	0.13	0.032	-0.061		0.049	0.13		0.025	0.036	-0.14			
IvingRoom	-0.1	0.75		0.11	1	0.95	0.53	0.51	0.61	0.58	0.15	0.14	-0.0035	0.022	0.34	-0.1			-0.012	-0.092	0.14	0.0095	0.088	0.0082	-0.018	0.03	0.05		0.058	0.07	-0.081			
lvingRoom*2	-0.11	0.7	0.019	0.11	0.95	1	0.49	0.51	0.65	0.66	0.13	0.15	0.039	-0.0042	0.31	-0.073		-0.097	0.0062	-0.081	0.11	-0.001	0.086	-0.026	0.0046	0.037	0.015		0.054	0.11	-0.049			
drawingRoom	-0.1	0.67	0.052	0.11	0.53	0.49	1	0.94	0.57	0.52	0.18	0.13	0.2	0.0095	0.35	0.026	-0.14	-0.091	-0.035	-0.01	0.065	-0.014	0.045	-0.1	0.09	0.022	-0.05		-0.017	0.042	0.053			
drawingRoom*2	-0.12	0.65		0.14	0.51	0.51	0.94	1	0.62	0.58	0.14		0.26		0.31	0.07	-0.14		-0.021	0.01	0.018	0.0048	0.046	-0.14	0.11	0.026				0.07	0.1			
bathRoom	-0.11	0.7		0.11	0.61	0.65	0.57	0.62	1	0.96	0.16	0.17	0.26		0.32	0.092			-0.034	0.0057	0.0092	0.012	0.067	-0.13	0.096	0.03			0.0083	0.069	0.12	- 1.0	0	
bathRoom^2	-0.093	0.64	0.0071	0.095	0.58	0.66	0.52	0.58	0.96	1	0.14	0.19	0.23		0.3	0.071			-0.012	-0.015	0.0039	0.015	0.076	-0.11	0.076	0.048			0.00053	0.1	0.1			
kitchen	0.021	0.15	0.022	0.0083	0.15	0.13	0.18	0.14	0.16	0.14	1	0.83	0.035	0.033	0.1	-0.045			-0.094	0.0055	0.051	-0.035	0.0049	0.012	0.028	0.042	0.041		0.011	-0.021	-0.04			
kitchen^2	).0081	0.14	0.008	0.011	0.14	0.15	0.13	0.12	0.17	0.19	0.83	1	0.0044	-0.0066	0.088	-0.021		-0.038	-0.046	0.00045	0.014	-0.0071	0.013	-0.021	0.019	0.13	0.0072		-0.0023	-0.011	-0.013	- 0.	5	
constructionTime	-0.29	0.35	0.2	0.19	0.0035	0.039	0.2	0.26	0.26	0.23	-0.035	0.0044	1	-0.23	0.16	0.49	-0.16	0.082	-0.062	0.23	-0.26	0.088	0.043	-0.29	0.22	0.0064	-0.45		-0.19	0.0024	0.52			
fiveYearsProperty	0.047	-0.017	-0.078	-0.066	0.022	0.0042		-0.027	-0.054	-0.06	0.033		-0.23	1	-0.021	-0.14	0.029		-0.022	-0.059	0.054	-0.082		0.13	-0.062	-0.012	0.13		0.041	-0.02	-0.15			
ladderRatio	0.055	0.42	0.069	0.11	0.34	0.31	0.35	0.31	0.32	0.3	0.1	0.088	0.16	-0.021	1	-0.083		-0.33	-0.021	0.041	0.26	-0.0041	0.053	-0.067	0.048	0.00093	0.062		0.026	0.047	-0.073			
elevator	0.088	0.16	-0.023	-0.13	-0.1	-0.073	0.026	0.07	0.092	0.071	-0.045	-0.021	0.49	-0.14	-0.083	1	0.12	0.48	-0.03	0.36	-0.69	0.019	0.0011	-0.19	0.18	-0.042	-0.73	-0.032	-0.26	-0.025	0.82	- 0.	0	
subway	0.33	-0.15	-0.31	-0.21	-0.12	-0.11	-0.14	-0.14	-0.11	-0.1	-0.037	-0.03	-0.16	0.029	-0.11	0.12	1	0.15	0.018	0.041	-0.15	-0.039	-0.055	0.027	0.013	-0.033	-0.079	0.02	-0.019	0.0085	0.086			
buildingType1	0.056	-0.014		-0.17	-0.12	-0.097			-0.054	-0.05	-0.06		0.082		-0.33	0.48		1	-0.015	-0.3	-0.65	0.012		-0.031	0.041	-0.018	-0.36			-0.015	0.41			
buildingType2	0.051	-0.05		-0.012	-0.012	-0.0062	-0.035	-0.021	-0.034	-0.012	-0.094		-0.062		-0.021	-0.03		-0.015	1	-0.012	-0.025	0.024	0.019	-0.0099	-0.0094	0.1		0.77	-0.0052	-0.0008	-0.03			
buildingType3	0.064	0.016	-0.009	-0.053	-0.092	-0.081	-0.01	0.01	-0.0057	-0.015	-0.0055	0.00045	0.23	-0.059	0.041	0.36	0.041	-0.3	-0.012	1	-0.5	0.016	-0.014	-0.089	0.083	0.00096	-0.28	-0.012	-0.1	-0.016	0.32	(	0.5	
buildingType4	0.079	-0.03	0.085	0.17	0.14	0.11	0.065	0.018	0.0092	0.0039	0.051	0.014	-0.26	0.054	0.26	-0.69	-0.15	-0.65	-0.025	-0.5	1	-0.033	0.04	0.11	-0.1	-0.019	0.55	-0.027	0.19	0.0012	-0.61			
renovationCondition1	-0.11	0.019		0.13	-0.0095	-0.001	-0.014	0.0048	0.012	0.015	-0.035		0.088		-0.0041	0.019		0.012	0.024	0.016	-0.033	1		-0.21	-0.29	0.0006			-0.0054	0.0016	0.026			
renovationCondition2	-0.06	0.074	0.08	0.032	0.088	0.086	0.045	0.046	0.067	0.076	0.0049		0.043		0.053	0.0011			0.019	-0.014	0.04	-0.049	1	-0.14	-0.19	0.051			0.0057	0.01	0.011	1		
renovationCondition3	).0024	-0.14	-0.038	-0.061	-0.0082	-0.026		-0.14		-0.11	-0.012	-0.021	-0.29	0.13	-0.067	-0.19	0.027	-0.031	-0.0099	-0.089	0.11	-0.21	-0.14	1	-0.81	-0.013	0.18		0.056	-0.02	-0.2		1.0	
renovationCondition4	0.077	0.097	0.002		-0.018	0.0046	0.09	0.11	0.096	0.076	0.028		0.22		0.048	0.18	0.013	0.041	0.0094	0.083	-0.1	-0.29	-0.19	-0.81	1	0.0048	-0.16		-0.053	0.015	0.18			
buildingStructure1	-0.033	0.02	0.025	0.049	0.03	0.037	0.022	0.026	0.03	0.048	0.042	0.13	0.0064		0.00093	-0.042		-0.018	0.1	0.0009€	-0.019-	0.00063	0.051	-0.013	-0.0048	1	-0.026-		-0.0082	0.0013	-0.048			
buildingStructure2	0.056	-0.16		0.13	0.05	0.015				-0.12	0.041		-0.45		0.062	-0.73		-0.36	-0.017	-0.28	0.55	-0.025		0.18	-0.16	-0.026	1	-0.018	-0.15	-0.024	-0.9			
buildingStructure3	0.054				-0.0031	0.0029				-0.014	-0.12				-0.021	-0.032		-0.016	0.77	-0.012	-0.027	0.021	0.0046	0.0032		0.00091		1	-0.0056	0.00086	-0.033			
buildingStructure4	0.0097	-0.042		0.025	0.058	0.054	-0.017	-0.022	-0.0083	0.0005	0.011		-0.19		0.026	-0.26		-0.13	-0.0052	-0.1	0.19	-0.0054	0.0057	0.056	-0.053	-0.0082	-0.15		1	0.0073	-0.28			
buildingStructure5	0.021	0.049		0.036	0.07	0.11	0.042	0.07	0.069	0.1	-0.021		0.0024		0.047	-0.025	0.0085	-0.015	0.0008	-0.016	0.0012	0.0016	0.01	-0.02	0.015	0.0013	-0.024-		0.0073	1	-0.043			
buildingStructure6	0.06	0.17	0.0079	-0.14	-0.081	-0.049	0.053	0.1	0.12	0.1	-0.04	-0.013	0.52	-0.15	-0.073	0.82	0.086	0.41	-0.03	0.32	-0.61	0.026	0.011	-0.2	0.18	-0.048	-0.9	-0.033	-0.28	-0.043	1			
	price_log	square_log	beup_diff_quad	Lat diff quad	IwingRoom	IvingRoom^2	drawingRoom	drawingRoom*2	bathRoom	bathRoom*2	Atchen	Mtchen*2	constructionTime	fiveYearsProperty	ladderRatio	elevator	subway	buildingType1	buildingType2	buildingType3	buildingType4	**novationCondition1	enovationCondition2	enovationCondition3	enovationCondition4	buildingStructure1	buildingStructure2	building Structure3	buildingStructure4	buildingStructure5	buildingStructure6			

price_log	1	-0.22	-0.45	-0.45
square_log	-0.22	1	0.056	0.14
Lng_diff_quad	-0.45	0.056	1	0.15
Lat_diff_quad	-0.45	0.14	0.15	1
fvingRoom	-0.1	0.75	0.027	0.11
livingRoom^2	-0.11	0.7	0.019	0.11
drawingRoom	-0.1	0.67	0.052	0.11
drawingRoom^2	-0.12	0.65	0.056	0.14
bathRoom	-0.11	0.7	0.0099	0.11
bathRoom^2	-0.093	0.64	0.0071	0.095
kitchen	0.021	0.15	0.022	-0.0083
kitchen^2	0.0081	0.14	0.008	0.011
constructionTime	-0.29	0.35	0.2	0.19
fiveYearsProperty	0.047	-0.017	-0.078	-0.066
ladderRatio	-0.055	0.42	0.069	0.11
elevator	0.088	0.16	-0.023	-0.13
subway	0.33	-0.15	-0.31	-0.21
buildingType1	0.056	-0.014	-0.11	-0.17

# **Correlation Analysis**

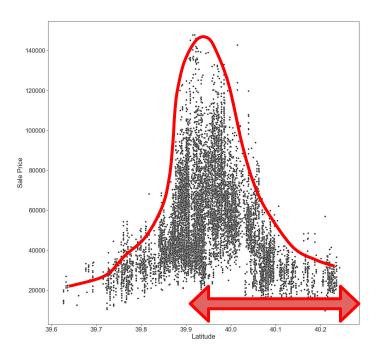
### price or total price?



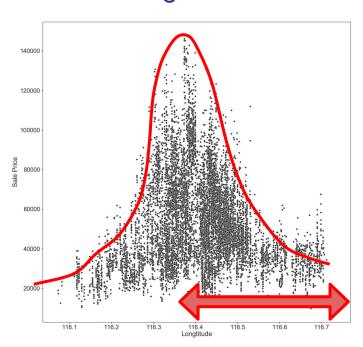
### **location**

latitude and longitude

#### latitude

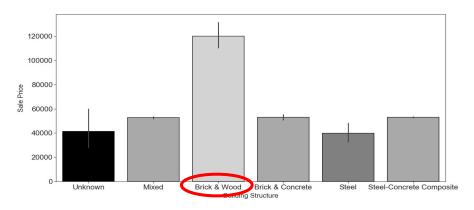


#### longitude

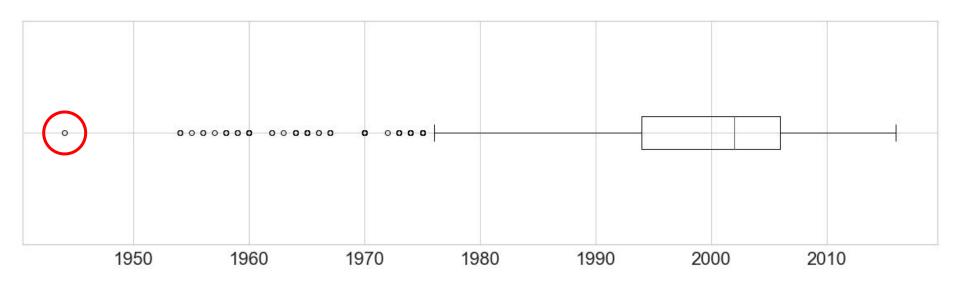


### building type & structure

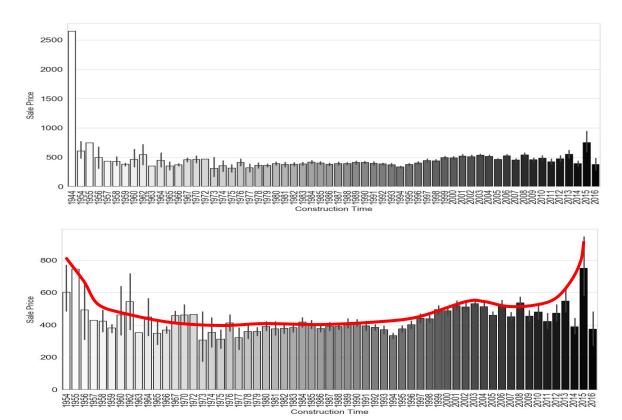




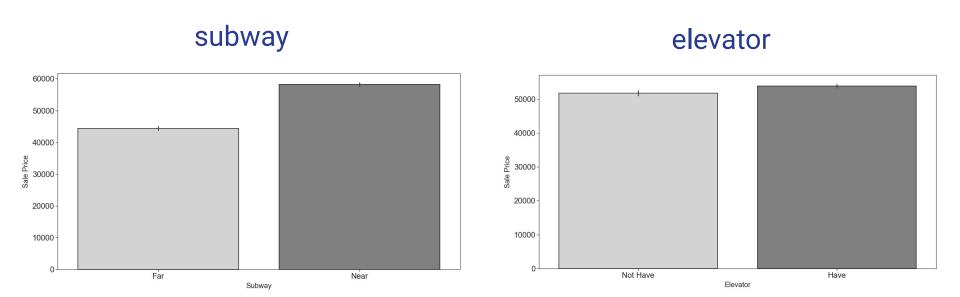
#### construction time



#### construction time



### transportation



# **Inferential Analysis**

# **Model Construction**

#### **Functional Form**

- Based on variable description
  - **log(price)** → dependent variable
  - $\circ$  log(square)  $\rightarrow$  independent variable
- Based on literature review
  - $\circ \quad (\mathbf{A} * \mathbf{age} + \mathbf{B} * \mathbf{age}^2)$
  - $\circ$  (**A** \* n + **B** \* n<sup>2</sup>)  $\rightarrow$  number of rooms (n)

### First Iteration

### **First Iteration Regression**

So	urce	SS	df	MS
M	odel	824.017038	27	30.5191496
Resi	dual	1027.31887	10,302	.099720333
-				Julian Carlo

Number of obs	=	10,330
F(27, 10302)	=	306.05
Prob > F	=	0.0000
R-squared	=	0.4451
Adj R-squared	=	0.4436
Root MSE	=	.31579

price_log	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
Lng_diff_quad	-7.801252	.1845434	-42.27	0.000	-8.162993	-7.439511
Lat_diff_quad	-5.981557	.1581843	-37.81	0.000	-6.291629	-5.671485
square_log	3232739	.0155626	-20.77	0.000	3537795	2927683
livingRoom	.1331211	.0148177	8.98	0.000	.1040755	.1621667
livingRoom2	0173575	.002662	-6.52	0.000	0225755	0121394
drawingRoom	.1285189	.0174101	7.38	0.000	.0943917	.162646
drawingRoom2	0236394	.0061725	-3.83	0.000	0357388	01154
kitchen	.098927	.0550441	1.80	0.072	00897	.2068241
kitchen2	.0060342	.0300601	0.20	0.841	0528895	.0649579
bathRoom	0552431	.0238766	-2.31	0.021	1020459	0084403
bathRoom2	.030211	.0060237	5.02	0.000	.0184033	.0420187
constructionTime_diff	.0109332	.0013903	7.86	0.000	.0082079	.0136585
constructionTime_diff2	0000485	.0000298	-1.63	0.103	0001069	9.84e-06
ladderRatio	.1684176	.0193751	8.69	0.000	.1304388	.2063965
elevator	.1502676	.0129221	11.63	0.000	.1249377	.1755975
fiveYearsProperty	0193993	.0067672	-2.87	0.004	0326643	0061344
subway	.0927824	.0070136	13.23	0.000	.0790345	.1065304
buildingType2	.6230491	.2747338	2.27	0.023	.0845173	1.161581
buildingType3	.0730704	.0096089	7.60	0.000	.0542351	.0919056
buildingType4	.0971986	.010536	9.23	0.000	.076546	.1178511
renovationCondition2	.0377757	.0215294	1.75	0.079	004426	.0799774
renovationCondition3	.0234049	.0131818	1.78	0.076	002434	.0492438
renovationCondition4	.104152	.0126615	8.23	0.000	.079333	.128971
buildingStructure2	.0493564	.2239212	0.22	0.826	3895726	.4882855
buildingStructure3	0	(omitted)				
buildingStructure4	.0356348	.2243508	0.16	0.874	4041363	. 4754059
buildingStructure5	.03659	.2423199	0.15	0.880	4384041	.511584
buildingStructure6	.1070451	.2240259	0.48	0.633	3320892	.5461795
cons	11.41771	.2329978	49.00	0.000	10.96099	11.87443

# Second Iteration

### **Regression Model Refined**

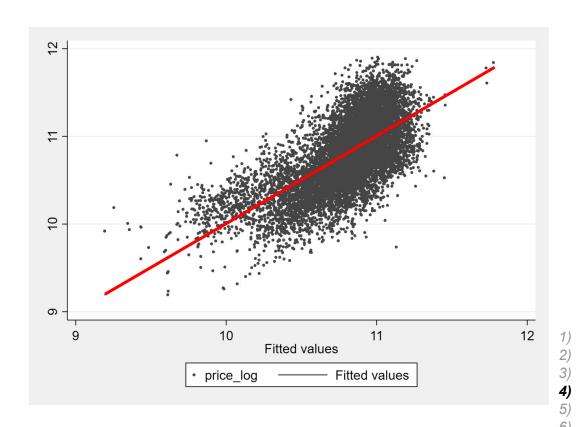
Source	SS	df	MS
Model	819.364779	18	45.5202655
Residual	1031.97113	10,311	.100084485
Total	1851.33591	10,329	.179236703

Number of obs	=	10,330
F(18, 10311)	=	454.82
Prob > F	=	0.0000
R-squared	=	0.4426
Adj R-squared	=	0.4416
Root MSE	=	.31636

price_log	Coef.	Std. Err.	t	P> t	[95% Conf.	<pre>Interval]</pre>
Lng_diff_quad	-7.768248	.1839029	-42.24	0.000	-8.128733	-7.407763
Lat_diff_quad	-6.131044	.1561888	-39.25	0.000	-6.437204	-5.824883
square_log	3235396	.015573	-20.78	0.000	3540658	2930135
livingRoom	.1338677	.0147842	9.05	0.000	.1048878	.1628476
livingRoom2	0174411	.0026519	-6.58	0.000	0226392	0122429
drawingRoom	.138355	.0170525	8.11	0.000	.1049288	.1717812
drawingRoom2	0258867	.0060764	-4.26	0.000	0377976	0139757
bathRoom	0487354	.0236405	-2.06	0.039	0950754	0023953
bathRoom2	.0293854	.0059681	4.92	0.000	.0176868	.0410839
constructionTime diff	.0084452	.0005022	16.82	0.000	.0074608	.0094295
ladderRatio	.1663154	.0193573	8.59	0.000	.1283714	.2042595
elevator	.1850089	.0102149	18.11	0.000	.1649856	.2050322
fiveYearsProperty	0172248	.006644	-2.59	0.010	0302482	0042013
subway	.0938314	.0070199	13.37	0.000	.080071	.1075918
buildingType2	.5083676	.1592971	3.19	0.001	.1961144	.8206208
buildingType3	.071238	.009554	7.46	0.000	.0525103	.0899657
buildingType4	.0892781	.0102589	8.70	0.000	.0691687	.1093876
renovationCondition4	.0843148	.0064586	13.05	0.000	.0716546	.0969749
_cons	11.62013	.0580308	200.24	0.000	11.50638	11.73388

# Model Diagnostic Test

## Fitted Values V.S. Observed Values



Linear in parameters

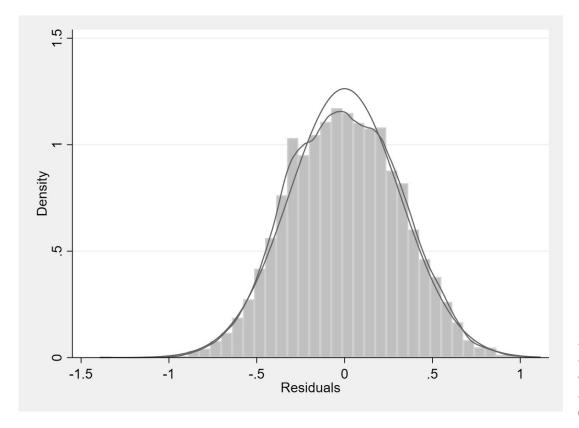
Zero-conditional mean

Random sampling
No perfect collinearity

Homoscedasticity

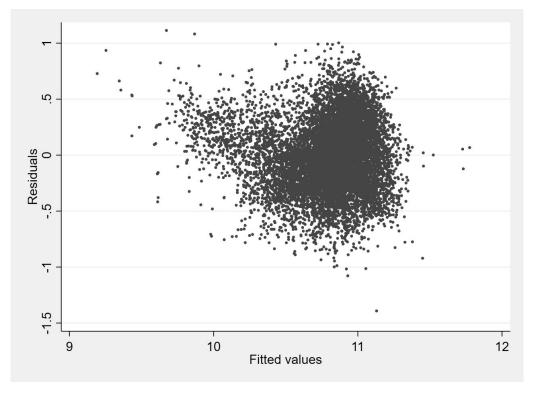
Normality

## **Normal Distribution of Residuals**



- Linear in parameters
- 2) Random sampling
- 3) No perfect collinearity
- Zero-conditional mean Homoscedasticity
- Normality

Residual plot u hat v.s. y hat



- ) Linear in parameters
  - Random sampling
- No perfect collinearityZero-conditional mean
  - Homoscedasticity
  - Normality

# **Breusch-Pagan Test**

Source	SS	df	MS	
Model	5.64821749	18	.31378986	
Residual	174.198896	10,311	.016894472	
Total	179.847114	10,329	.017411861	

Number of obs	=	10,330
F(18, 10311)	=	18.57
Prob > F	=	0.0000
R-squared	=	0.0314
Adj R-squared	=	0.0297
Root MSE	=	.12998

uhat2	Coef.	Std. Err.	t	P> t	[95% Conf.	<pre>Interval]</pre>
Lng_diff_quad	4908019	.0755575	-6.50	0.000	6389092	3426946
Lat_diff_quad	.024121	.064171	0.38	0.707	1016666	.1499087
square_log	0315782	.0063983	-4.94	0.000	04412	0190363
livingRoom	.0092832	.0060742	1.53	0.126	0026233	.0211898
livingRoom2	0006907	.0010895	-0.63	0.526	0028263	.001445
drawingRoom	0136014	.0070061	-1.94	0.052	0273347	.0001319
drawingRoom2	.0056361	.0024965	2.26	0.024	.0007424	.0105298
bathRoom	0338162	.0097128	-3.48	0.001	0528552	0147771
bathRoom2	.0161978	.002452	6.61	0.000	.0113914	.0210042
constructionTime diff	0013111	.0002063	-6.35	0.000	0017155	0009066
ladderRatio	0013404	.007953	-0.17	0.866	0169299	.0142491
elevator	0257976	.0041969	-6.15	0.000	0340242	0175709
fiveYearsProperty	0156391	.0027297	-5.73	0.000	0209899	0102884
subway	.0070068	.0028842	2.43	0.015	.0013533	.0126604
buildingType2	1572712	.0654481	-2.40	0.016	2855621	0289803
buildingType3	0051371	.0039253	-1.31	0.191	0128315	.0025573
buildingType4	0049585	.0042149	-1.18	0.239	0132206	.0033036
renovationCondition4	0079897	.0026536	-3.01	0.003	0131912	0027882
_cons	.2971915	.0238423	12.46	0.000	.250456	.343927

# Third Iteration

# **Heteroskedasticity Robust Version - Final Model**

Linear regression

Number of obs	=	10,330
F(18, 10311)	=	471.59
Prob > F	=	0.0000
R-squared	=	0.4436
Root MSE	=	.31608

price_log	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval
Lng_diff_quad	-7.772003	.1794032	-43.32	0.000	-8.123668	-7.420338
Lat_diff_quad	-6.045975	.1498406	-40.35	0.000	-6.339692	-5.75225
square_log	3266811	.0171551	-19.04	0.000	3603085	293053
livingRoom	.1266209	.0151061	8.38	0.000	.0970101	.156231
livingRoom2	0160333	.0028228	-5.68	0.000	0215666	010500
drawingRoom	.1380134	.0178715	7.72	0.000	.1029818	.173045
drawingRoom2	0269155	.0065875	-4.09	0.000	0398282	0140028
bathRoom2	.0177667	.0033566	5.29	0.000	.0111872	.0243462
onstructionTime diff	.0090475	.0005247	17.24	0.000	.0080189	.010076
ladderRatio	.1711196	.0219524	7.80	0.000	.1280887	.214150
elevator	.1469463	.0148498	9.90	0.000	.1178378	.176054
fiveYearsProperty	016668	.006749	-2.47	0.014	0298974	003438
subway	.0928612	.0069073	13.44	0.000	.0793215	.106400
buildingType2	.5371018	.0414938	12.94	0.000	.4557659	.618437
buildingType3	.0712969	.009512	7.50	0.000	.0526515	.089942
buildingType4	.0931076	.010597	8.79	0.000	.0723355	.113879
renovationCondition4	.0832504	.0064659	12.88	0.000	.0705759	.095924
buildingStructure6	.0563847	.0138637	4.07	0.000	.0292091	.083560
cons	11.57876	.0659371	175.60	0.000	11.44952	11.7080

# Conclusion

# Interpretation of Our Model

```
price_log=(+11.58)
         (-7.77) Lng_diff_quad (-6.05)Lat_diff_quad (-0.33)square_log
         (+0.13)livingroom (-0.02)livingroom<sup>2</sup>
         (+0.14)drawingroom (-0.03)drawingroom<sup>2</sup> (+0.02)bathroom<sup>2</sup>
         (+0.01)constructionTime (+0.17)ladderRatio (+0.15)elevator
         (-0.02) five Years Property (+0.09) subway
         (+0.54)buildingType2 (+0.07)buildingType3 (+0.09)buildingType4
         (+0.08)renovationCondition4 (+0.06)buildingStructure6 (+u)
```

#### (-7.77) Lng\_diff\_quad (-6.05)Lat\_diff\_quad

```
price_log= (+11.58)

(-7.77) Lng_diff_quad (-6.05)Lat_diff_quad (-0.33)square_log
 (+0.13)livingroom (-0.02)livingroom<sup>2</sup>

(+0.14)drawingroom (-0.03)drawingroom<sup>2</sup> (+0.02)bathroom<sup>2</sup>

(+0.01)constructionTime (+0.17)ladderRatio (+0.15)elevator

(-0.02)fiveYearsProperty (+0.09)subway

(+0.54)buildingType2 (+0.07)buildingType3 (+0.09)buildingType4

(+0.08)renovationCondition4 (+0.06)buildingStructure6 (+u)
```

### (+0.54)buildingType2 (bungalow/Siheyuan) (base category: tower):

• If the house is a bungalow  $\rightarrow$  price increase by  $[\exp(0.54) - 1] \rightarrow 71.6\%$  (relative to tower).

```
price_log= (+11.58)

(-7.77) Lng_diff_quad (-6.05)Lat_diff_quad (-0.33)square_log

(+0.13)livingroom (-0.02)livingroom²

(+0.14)drawingroom (-0.03)drawingroom² (+0.02)bathroom²

(+0.01)constructionTime (+0.17)ladderRatio (+0.15)elevator

(-0.02)fiveYearsProperty (+0.09)subway

(+0.54)buildingType2 (+0.07)buildingType3 (+0.09)buildingType4

(+0.08)renovationCondition4 (+0.06)buildingStructure6 (+u)
```

### (-0.33)square\_log:

• For every 1% increase in the total square meter of the house  $\rightarrow 0.33\%$  decrease in price.

```
price_log= (+11.58)

(-7.77) Lng_diff_quad (-6.05)Lat_diff_quad (-0.33)square_log

(+0.13)livingroom (-0.02)livingroom<sup>2</sup>

(+0.14)drawingroom (-0.03)drawingroom<sup>2</sup> (+0.02)bathroom<sup>2</sup>

(+0.01)constructionTime (+0.17)ladderRatio (+0.15)elevator

(-0.02)fiveYearsProperty (+0.09)subway

(+0.54)buildingType2 (+0.07)buildingType3 (+0.09)buildingType4

(+0.08)renovationCondition4 (+0.06)buildingStructure6 (+u)
```

### (+0.13)livingroom (-0.02)livingroom<sup>2</sup>

(+0.14)drawingroom (-0.03)drawingroom<sup>2</sup>

(+0.02)bathroom<sup>2</sup>

```
price_log= (+11.58)

(-7.77) Lng_diff_quad (-6.05)Lat_diff_quad (-0.33)square_log
 (+0.13)livingroom (-0.02)livingroom<sup>2</sup>

(+0.14)drawingroom (-0.03)drawingroom<sup>2</sup> (+0.02)bathroom<sup>2</sup>

(+0.01)constructionTime (+0.17)ladderRatio (+0.15)elevator
 (-0.02)fiveYearsProperty (+0.09)subway
 (+0.54)buildingType2 (+0.07)buildingType3 (+0.09)buildingType4
 (+0.08)renovationCondition4 (+0.06)buildingStructure6 (+u)
```

### (+0.01)constructionTime

• To our surprise, the age of construction only has a weak positive effect on price. Unit house price increase by 1% for every 1 year increase in age.

# Critical Thoughts

(+0.01)constructionTime

(0) construction Time<sup>2</sup>

# Hypothesis:

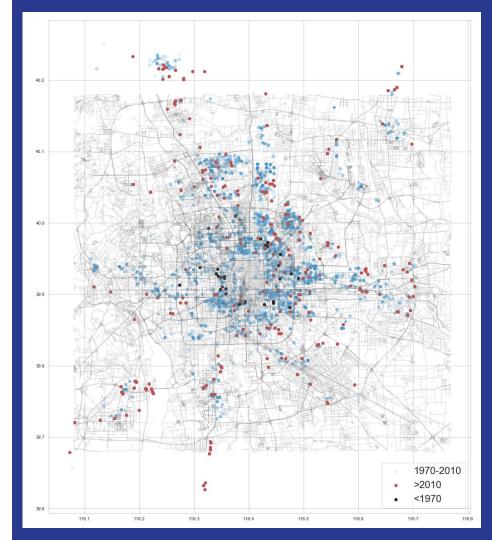
(A) age

+(B) age  $\overline{2}$ 

(A<0, B>0)

(+0.01)constructionTime

(0) construction Time<sup>2</sup>



# Limitations and Further Work

# Methodology Limitation and Further Work

- OLS with robust standard error
- WLS (weighted least squares)
- FGLS (feasible generalized least squares)

- OLS with robust standard error
- WLS (weighted least squares)
- FGLS (feasible generalized least squares)

- OLS with robust standard error
- WLS (weighted least squares) <</li>

FGLS (feasible generalized least squares)

Heteroskedasticity Function Form (?)

# Information Limitation and Suggestion

- Economic theories
  - a. Hedonic pricing function (Rosen, 1947)
    - i. Structure
    - ii. Location
    - iii. Neighborhood
- 2. Common sense

### 1. Housing structure:

- a. Number of floor
- b. Facing of the house

### 2. Housing location:

a.

b

### 3. Neighborhood:

a.

b.

C.

d

#### 1. Housing structure:

- a. Number of floor
- b. Facing of the house

### 2. Housing location:

- a. Macro: Distance to secondary city-centers (miles)
- b. Micro: Distance to school, hospital, recreational area, etc

### 3. Neighborhood:

- a.
- b.
- C.
- d.

#### 1. Housing structure:

- a. Number of floor
- b. Facing of the house

### 2. Housing location:

- a. Macro: Distance to secondary city-centers (miles)
- b. Micro: Distance to school, hospital, recreational area, etc

### 3. Neighborhood:

- a. Median household income
- b. School rating
- c. Number of major crimes
- d. Residential density

# Reference

### References

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# Thank you!